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DECLARATION

The undersigned, Jan McLin Clayberg, having an office at 5316 Little Falls Road, Arlington, VA 22207-1522, hereby states that she is well acquainted with both the English and German languages and that the attached is a true translation to the best of her knowledge and ability of International Patent Application PCT/EP 2005/055228 of TIEDE, S., et al., entitled "PORTABLE DRIVE UNIT".

The undersigned further declares that the above statement is true; and further, that this statement was made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or document or any patent resulting therefrom.


Jan McLin Clayberg

PORTABLE DRIVE UNIT

5 The present invention is based on a portable drive unit for handheld power tools driven by suction and/or blown air.

Prior Art

10 Compact shop vacuum cleaners are known from US 2003/0208874 A1 and European Patent Disclosure EP 1 382 285 A2, which serve as a cleaning tool and are provided with various accessories for vacuuming up dust, chips and the like as well as liquids, and which are furthermore usable in the blower mode as well.

15 From International Patent Disclosure WO 03/026841 A1, a tool case is also known which contains a vacuum cleaner unit for picking up chips and dust. The known vacuums or tool cases are only conditionally suitable as a drive unit and carrying box for suction- or blown-air-operated handheld power tools.

Advantages of the Invention

20 By the present invention having the characteristics of claim 1, a compact portable drive unit has been created which can be used both alone as a vacuum cleaner and for driving air-drivable tools, especially handheld power tools, with simultaneous vacuuming of dust while these tools are in operation, and which
 25 serves as a carrying box for preferably a plurality of various handheld tools and with them forms a system for various processing methods that can be performed with either suction or blown air or both.

30 Because the drive unit has a housing which is designed as a case that can be closed with a lid and whose air feeding power is adapted to the power required by the handheld power tool and at the same time serves to store at least one handheld power tool, especially with accessories as well as air-carrying tubes or hoses whose diameter is approximately 40 mm, a novel handheld power tool
 35 system is created that operates without connecting the handheld power tool to electrical current directly and that furnishes enough working power and suction

power.

5 Because it has a housing that is designed as a rectangular case with outward-curved side faces, rounded corners and edges, and a flat top side and underside, especially with a lid curved inward in dishlike fashion in the middle with a strutlike handle, an especially conveniently and handily transported drive unit for air-driven hand tools is created.

10 Because its housing comprises a case part, open at the top, which is closable there by means of a lid that in particular is hinged about a hinge region, handheld power tools stored in it can be stowed in especially good order and easily removed.

15 Because the lid is formed of two shells, of which the upper shell comprises especially bending-resistant, impact-proof material and has a central opening with a strutlike bridge as well as downward-bent, curved outer edges and corners, and of which the lower shell comprises more-elastic, softer material and fits over the central opening in the upper shell and protrudes, curved downward, from the strutlike bridge, an especially stable container part that protects what is being
20 carried against impact from outside but simultaneously embraces it gently on the inside is created.

Because one side face of the case part has at least one, in particular mushroom-shaped protrusion about which a power cord, intended for supplying
25 current to the electric motor, can be wound, and the at least one protrusion acts as a parking face, on which the drive unit can be set down and at the same time acts as an impact face for absorbing unwanted impacts in heavy-duty construction site operation that act on a hinge region of the lid, the product being carried is accommodated in a way that is especially securely protected.

30 Because retaining/clamping elements are provided in the case part for accommodating the handheld power tool, and in particular for firmly retaining and/or clamping it in a prestressed manner, these elements in particular being in the form of inflatable air cushion elements, the handheld power tool can be carried

in such a way that it is protected against uncontrolled motion of its own or relative motion in the interior of the case part when the drive unit is being carried and thus also is protected against damage.

5 Because one air inlet and one air outlet opening, with means for coupling a hose, are located side by side each on one of the two shorter side faces of the case part, then depending on the choice of handheld power tool to be connected, a fast, convenient change of the operating setting of the drive unit from the suction mode to the blower mode is possible.

10 Because skeleton-like reinforcing parts that support the edges are provided in the lower case part, in form of framelike base parts, onto which more soft-elastic lateral shells can be constructed, shock-absorbing regions of the housing that comprise expensive, heavy material can be created with economy of material, and
15 surfaces less subject to shock comprise the lighter-weight, less-expensive material and at the same time thus improve shock absorption toward the inside.

20 Because recesses are provided on the reinforcing parts onto which the shells can be constructed, the weight of the housing can be kept low.

25 Because movable parts, intended for operation by hand, such as lid closure buttons and a sealing lid for air entry are kept in a contrasting color compared to the color of the portable drive unit, they can be found especially quickly and conveniently.

30 Because the case part has at least one vertical partition, which separates the vacuum cleaner and the storage space from one another, the handheld power tool and its accessories can be stowed especially logically and securely.

35 Because the unit comprises two cases located side by side that in particular are integrated with the case part and that in particular each have one lid, are closable, preferably in overlocking fashion, the housing structure is rigid, and objects stowed in it are located in a secure, protected way.

Because the two cases of the vacuum cleaner are designed as a motor case and a dust box with a dust monitoring opening, they and their contents are securely protected, independently of one another, from outside especially against twisting in the event of shock and impact on the housing.

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Because detent clamping means for a suction hose are located on the inside of the lid, and the suction hose is designed in overlocking fashion, spirally placed/located parallel to the lid face, the hose is stowed in an especially space-saving and handy way.

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Because a bypass valve is located on the dust lid, the vacuum cleaner unit is protected against an overload.

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Because sealing lips are located between the lid and the case part, the entry of air from outside and the escape of dust are reliably precluded.

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Because black reinforcing parts embrace the green/blue case part/lid part, the softer and harder regions of the housing can be distinguished intuitively from one another.

25

Because lighting means are located in the interior of the drive unit, especially in the case part/lid part, these means in particular having LEDs and/or being in the form of graphical characters and/or symbols, preferably a fluorescent written marking, especially good monitoring of the contents in the storage compartment of the case part at a given time is possible.

30

Because the outer faces of user control elements, particularly for opening and closing a lid or for actuating a switch button for turning the drive unit on or off, are located inside the outer contour of the housing, they or the contents stowed therein are protected against unintentional opening or damage while being carried.

Because the switch button for turning the drive unit on or off is accessible from outside for foot- or hand-operated control via an opening in the lid, both when the lid is closed and when it is open, turning the drive unit on and off is possible

especially conveniently, simply, and safely.

Because a hose adapter is located on the air outlet in such a way that it can be snapped in place and can be replaced with a blower grille, in particular with a dust filter, in a firmly retainable way, the change between the blower and the suction mode - and vice versa - can be made especially quickly.

Because a replaceable adapter for the suction hose of the drive unit can be replaced with a suction extraction adapter, intended predominantly for vacuum cleaning, especially for dust extraction in electric tools, the drive unit is usable, conveniently and with minimal conversion time, as both a vacuum cleaner and as a suction extractor for electric power tools. The air stream can be used for driving the handheld power tools and for simultaneous suction extraction or blowing of dust, chips, and so forth.

Because an intermediate coupling piece for attaching an additional suction hose piece is located on the suction hose of the drive unit, the suction hose can be lengthened as needed.

The user thus has the capability of using the drive unit for different hand-held power tools that are driven with suction and/or compressed air and that require no direct power supply of their own.

Drawings

The invention is described in further detail below in terms of one exemplary embodiment in conjunction with the drawings.

Fig. 1 shows a three-dimensional view of the drive unit obliquely from the front;

Fig. 2 shows the drive unit obliquely from behind;

Fig. 3 shows the drive unit of Fig. 1 obliquely from above with the lid open;

Fig. 4 shows the drive unit of Fig. 1 obliquely from the left;

Fig. 5 shows the drive unit of Fig. 3 with a hose put in place in spiral form;

5 Fig. 6 shows a suction-operated handheld power sander for operation with the drive unit;

Fig. 7 is an exploded view of the drive unit;

10 Fig. 8a shows a hose coupling for attaching the suction hose to the drive unit or to an air-driven handheld power sander;

Fig. 8b shows a top plate with a connection stub for connecting the hose to the blower opening;

15 Fig. 8c shows a coupling piece for connecting the suction hose to an electric handheld power tool, with a connection stub for a 19-millimeter hose;

20 Fig. 8d shows a coupling piece for connecting the suction hose to an electric handheld power tool, with a connection stub for a 35-millimeter hose;

Fig. 8e shows an intermediate hose coupling for attaching an extension piece and the suction hose; and

25 Fig. 8f shows a drilling aid for a hand power drill for suction extraction of drilling dust at its site of origin.

Description of the Exemplary Embodiment

30 The three-dimensional view shown in Fig. 1 of a caselike drive unit 10 obliquely from the front shows its longitudinal axis 12, which extends parallel to the front side 14 and back side 16. The lower region of the drive unit 10 is a six-sided, block-shaped case 13, open at the top, which is closed on its underside 15 by means of a bottom 17. The case 13 also has a left and right side 18, 20, a and a

top side 25, which is embodied by the lid 24.

The case 13 is formed by a chassislike skeleton case 22 of impact-proof high-quality material, which has a left and a right side shell 19, 21 of comparatively elastic, lightweight material and the pivotably supported lid 24 hammered on on the hinge side 25, the lid forming the top side 26 of the drive unit 10.

The lid 24 comprises a lid frame 26, which like the skeleton case 22 comprises impact-proof, high-quality material and on which a lid shell 27 that is concave - when seen from above - is secured. The lid frame 26 forms a central handle piece 28, which can be conveniently grasped with the hand and assures good, balanced carrying of the drive unit 10.

Two snap closures 30, 31 are located on the front side 14 of the case 13, at the top, adjacent to the lid 24, and with them the lid 24 on the case 13 can be closed securely against unintentional opening.

On the left side 18, a suction opening 32 and a blower opening 33 pass parallel to one another through the left side shell 19.

On the top side of the case 13, in the corner between the left side 18 and the back side 16, there is a switch button 34, which is held elastically prestressed in its outset position by means of a spring system 35, and from that position it can be pressed from above into the on or off position. The switch button 34 passes through a fitting opening 29 in the lid 24, so that its outer face extends flush with the outer face of the lid 24, and even when the lid 24 is closed, this switch button can be actuated from outside by foot or with a hand. The switch button 34 is seated on an upper part 36, which is connected in actuating fashion to a switch 37.

On the back side 16, there is a cord post 38 for holding a power cord 42 that can be wound around it and that emerges, through a watertight outlet opening not identified by reference numeral in the back side 16 and can be coupled electrically in the interior of the case 13 to a motor 104 via a cord clamp 39. In the interior of the case 13, there is a cord harness 40, which connects the switch 37 to the motor

104 and to other electrical elements that are not shown.

5 A cord holder 41 can be firmly clamped to the edge of the cord post 38, and with this holder the free end of the power cord 42 can be clamped firmly but removably to it.

10 Between a motor case lid 61 and a motor case 62 for receiving the motor 104 for driving a suction fan, not identified by reference numeral, there is a motor case seal 42.

15 The suction opening 32 is closable by means of a removable suction lid 48, which prevents dust and chips from its dust box 55 from being able to fall out while the drive unit 10 is being carried. The blower opening 33 is covered by an outlet filter 44 which is firmly retained on it by means of an outlet grille 46 there.

20 The dust box 55 is closable essentially in airtight fashion by a dust lid 56 by means of a dust seal 57; the dust lid 56 can be conveniently opened or closed by means of a latchlike protrusion 49. In the dust lid 56, there is a bypass 50, which if the dust box 55 is overfilled opens a valve 53, by way of which air enters, bypassing the suction opening 32. The bypass 50 comprises a fixation lid 51, which carries the valve 53 and a seal 52; the valve 53 is kept prestressed by a spring 54 and does not open and allow additional air in until beyond a minimum underpressure.

25 The motor case 62 is joined to the dust box 55 through a common opening, which is covered by an intake filter 54. The intake filter 53 prevents aspirated air chips and dust from reaching the motor 105.

30 The motor case lid 61 is pivotable about a hinge, not shown, for opening and closing purposes. On the side diametrically opposite the hinge, it is provided with a finger grip 60, into which the fingers of one hand can be placed in a gripping manner for opening the motor case lid 61.

The snap closures 30, 31 comprise two toggle levers 64, 65, which are each

pivotal about a respective axis 68 by means of a respective tensing button 66 and a respective detent lever 67. Thus the lid 24 is closable - pivotal about a hinge side 26 - relative to the case 13 in a way that is secure against unwanted opening.

5

Fig. 2 shows the drive unit 10 obliquely from behind, looking toward the back side 16; the cord post 38 with the cord holder 41 are clearly visible. It can also be seen that the face of the cord post 38 is so large that it can act as a parking face for setting down the drive unit. The shell-type construction of the housing 11 of the drive unit 10 can also be seen, along with the disposition of the suction and blower openings 32, 33.

Fig. 3 shows the drive unit 10 of Fig. 1 obliquely from the top with the lid 24 open, looking into its interior. The intended spiral arrangement of the suction hose 78 to be put in place and the design of the retaining and clamping elements 45 for receiving it in the lid 24 are visible. Moreover, the top view on the case 13, switch button 34, opening 29 in the lid 24 for the passage through it of the switch button 34, the latch 49 for pivoting/opening the dust lid 56 about its hinge 560, the bypass 50 seated on it, the finger grip 60 for opening the motor case lid 61, a storage compartment 63 for accommodating a delta sander 70 and accessories 98 are all shown. It can be seen that approximately half the volume of the case 13 is available for accommodating the delta sander, and the entire volume of the lid 24 is available for accommodating the suction hose 78.

Fig. 4 shows the drive unit 10 obliquely from above looking toward the left side 18 with the suction opening 32 and the blower opening 33 and toward the front side 14 and the top side 25; the details described above are clearly shown and need not be repeated.

Fig. 5 shows the drive unit 10 with the suction hose 78 placed in a spiral on the inside in the open lid 24, similarly to Fig. 3, but the accessories 98 are different.

Fig. 6 shows a suction-operated handheld power sander designed as a turbine delta sander 70, for operation with the drive unit 10. The handheld power sander

has a housing 71 shaped like an iron for clothing, with an upper region that can be grasped by the hand and that serves as a guiding handle 72. Toward the back, the housing 71 continues in the form of a tubular housing region 73 which serves as a main handle that is conveniently grasped by the hand that operates the tool.

5

This main handle opens into a coupling stub 80, into which a hose coupling piece 81 of the suction hose 78 can be inserted in overlocking fashion for connecting the delta sander 70 to a drive unit 10 for operation with suction. At the top in the region of the guiding handle, a switch button 74 is located, with which the flow of suction can be reduced. With the suction, a turbine, not shown, in the interior of the housing 71 that sets a sander plate 76 into orbital motion is driven.

10

The hose coupling piece 81 is connectable in form-locking and overlocking fashion to the coupling stub 80 via detent cams 82, and there it enters into detent openings, not identified by reference numeral, in the wall of the coupling stub 80.

15

Fig. 7 shows an exploded view of the drive unit 10 - broken down into its individual parts. The details and characteristics described in conjunction with the previous drawings are shown especially clearly.

20

Fig. 8a shows a hose coupling for attaching the suction hose to the drive unit 10 or to a delta sander 70 or similar air-driven handheld power tool.

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Fig. 8b shows a blower adapter 83, which comprises a top plate 100 that is provided with a connection stub 101, which serves to connect the suction hose 78 to the blower opening 33, and this opening can be replaced for the outlet grille 46 with the outlet filter 44 for the suction mode.

30

To that end, the top plate is provided on its lateral ends with detent tongues 84, which can be clipped onto the left side 18 on the outside in the region of the blower opening 33.

Fig. 8c shows a hose coupling piece 85 for connecting the suction hose 78 to a slender (19 mm) suction hose connection/waste air stub of an electric handheld

power tool that produces a medium to a large amount of dust.

Fig. 8d shows another coupling piece 88 for connecting the suction hose 78 to a somewhat less-slender (35 mm) suction hose connection of an electric power
5 tool that produces a medium to a large amount of dust.

Fig. 8e shows an intermediate hose coupling 91 for coupling a suction
extractor hose lengthening piece, whose diameter matches that of the suction
extraction hose 78.

10 Fig. 8f shows a drilling aid 93 for passing through a drill for suction extraction
of the drilling dust produced in drilling.

Upon connection to the suction opening 32, the drive unit 10 can drive the
15 following devices by suction, for instance, and simultaneously extract the dust and
dirt produced by suction, dust and dirt that is filtered out by an arbitrary filter
system: oscillating/multisander, eccentric sander, plaster cardboard cutter, drilling
aid.

20 On being connected to the blower opening 33, the drive unit 10 can operate
the following devices with the "compressed" air flow: paint spray gun, blower
nozzle/joining nozzle, hot-air gun, valve attachment for inflating inflatable rafts and
air mattresses, etc.

25 In the case 13 of the drive unit 10, there is a storage compartment 63 for the
delta sander 70 and suction function accessories, such as a joining nozzle, drilling
aid 93, adapter for power tools 85, 88, adapter for vacuum cleaner accessories,
sandpaper (Z), or the like.

30 The power cord 42 is wound around the cord post 38 on the back side 16 of
the drive unit 10 and secured to the cord post 38 with a cliplike cord holder 41. The
cord post 38 can also be used as a parking face for stowing the drive unit 10
upright.

The blower adapter 83 for replacement with the blower grille 44 serves to provide improved air throughput in the suction mode and better pressure buildup in the blower mode.

- 5 The suction hose 78 has a coupling stub 80, acting as a fast-action coupler, with which it can be connected to vacuum cleaners, turbine delta sanders, or other associated devices.

- 10 The switch button 34 on the upper edge/corner makes it possible to turn the device on and off conveniently using the foot, and to turn the device on and off either with the lid open and with the lid closed.

- 15 The case 13 stiffened with side shells 19, 21, which are braced against and/or screwed to the skeleton case 22. Only by using a stiffer/higher-quality material for part of it can the strength of the skeleton case 22 be increased without having to use the more-expensive material for the entire housing 11.

- 20 Both the suction opening 32 and the blower opening 33 with finger depression are integrated into one side shell 19, so that in that location there is great freedom of design with simpler unmolding of the injection-molded part.

- 25 The lid shell 23 is likewise located, in the form of a concave insertion part, centrally in the handle region of the handle piece 28 in the flat lid 24. As a result, this region can be better unmolded from the injection molding tool; the stackability of the drive unit is assured, and upon use, the storage place for small parts or tools with the lid closed is assured and is used as a design element.

- 30 The bypass valve 50 in the dust lid 56 are alternatively in the filter housing assures that the motor 104 will not run at an overload when the dust bag is added. The motor is cooled with the suction. If the dust bag is full of the ground material, or its pores have become clogged, the remaining cooling air can no longer cool the motor 104 adequately without a bypass valve 50. The motor would then overheat. The underpressure/bypass valve 50 opens as soon as the underpressure in the filter space between the dust filter and the motor fan, drops below a defined value,

which can be set via a spring 54. By opening the bypass valve 50, air is additionally aspirated, bypassing the filter, for adequately cooling the motor [7].

5 When the drive unit 10 is being carried, the escape of dust and dirt from the suction opening 32 is prevented by the disposition of the suction lid 48. Opening is made easier by a grip depression in the side part [24], and loss is prevented by fastening with a pin to the side part [24].